XVIII.—*Report of the Results of Researches in Physiological Botany made in the year* 1839. By F. J. Meyen, M.D., Professor of Botany in the University of Berlin*.

[Continued from p. 35.]

Anatomy of Vegetables.

M. Decaisne† has published a short notice on the structure of the wood of the Misseltoe: he could not confirm the statement of M. Dutrochet, who says that the woody body is wanting in the articulation (Gliederung) between the internodes, and is only connected by a cellular layer of pith, so that, properly speaking, the internodes are connected together solely by the bark. According to M. Decaisne's observations, it is exactly in the internodes that the vessels of the bark are separated; and he says, that on this fact the articulation of this plant depends, but not on the separation of the fibres of the wood. The wood of *Viscum* exhibits no vessels (hereby is meant simple spiral tubes.—*Mey.*), and only in the pith were seen annular tubes; the nerves of the leaves did not possess any spirals. The number of the vascular bundles (Holzbündel) in young twigs is regularly eight, seldom seven or nine, and each is surrounded, both inwardly and outwardly, with a bundle of bast cells.

M. Dutrochet‡ attempted to demonstrate to the Academy that his former statements were correct.

Already in 1838 M. Morren§ had made some physiological observations on a new plant named by him *Malaxis Parthoni*, which, however, I have only lately seen. M. Morren indicates, that a colouring matter similar to indigo must be contained in the leaves of this plant, as in the flowers of *Calanthe veratrifolia* and in the leaves of *Mercurialis perennis*, &c. The presence of indigo in the *Orchideæ* was however discovered years ago by M. Marquart in Bonn. The air-rootlets which were examined by M. Morren were covered with a quantity of very fine hairs, consisting of single transparent cells, the walls of which were very thin, and exhibited within a rotation (cyclosis). [The universal appearance of these rotating streams in the root-hairs of Phanerogams I have already proved.—*Mey.*]

M. Morren observed, that in some of these hairs the globules collected together in masses and formed a kind of partition, by which the cyclosis was prevented; indeed he be-

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[*] Translated and communicated by Henry Croft, Esq.

[†] De la Structure ligneuse du Gui. Comptes Rendus 1839, p. 204.

[‡] Comptes Rendus, p. 215.

[§] Notice sur une nouvelle espèce de Malaxis, &c. Bull. de l'Acad. de Sci. de Bruxelles, tom. v. No. 8.

lieves that this is as it were the commencement of the formation of partitions, which are observed to appear in *Confervæ*, &c. for the increase of the cells. I cannot agree to this hypothesis, for these partitions are formed in quite a different manner, and the appearance of a partition by which the cyclosis within a utricle is divided into two parts is quite an accidental and rare phænomenon. I myself observed it in the *Charæ* in 1825 (Linnæa, 1827, p. 66), and saw that thereby two streams were produced, which lasted until the obstruction was carried away. M. Morren observed spiral fibrous cells of various forms in the enlargements of the base of the stalk of this new *Malaxis*.

M. Morren* has published an interesting paper 'On the Discoid Pith of Plants,' which had been observed by Grew in *Juglans regia*, by M. Mirbel in *Nyssa aquatica* and *Phytolacca decandra*, as well as by DeCandolle in *Jasminum officinale*. M. Morren thinks it very probable that this structure of the pith may occur in many other plants; he himself found it in plants belonging to the families *Santalaceæ*, *Juglandeæ*, *Phytolacceæ*, *Jasmineæ*, and *Bignoniaceæ*; but he remarks, that some species of a genus exhibit this formation, while others do not. The figures which accompany this treatise of M. Morren were drawn from *Begonia argyrostigma*, *Juglans regia*, *Jasminum fruticans*, and *Phytolacca decandra*; the pith in these, as in many other plants, exhibits in the earlier periods of growth a homogeneous mass of cells, in which, finally, more or fewer horizontal clefts (slits) make their appearance. These slits are placed in regular order above one another; they increase gradually, and are finally separated merely by membranous dissepiments. M. DeCandolle believed that these cavities arose from a rupturing of the cellular tissue caused by the extension produced by the growth of the plant; but M. Morren has shown that they arise from a regular separation of the cells, and are therefore to be compared to the air-passages.

Mr. Patrick Keith† has made some observations on pith, in order to settle the two following questions:—1st, Does the pith appear in any part of the root? and 2ndly, Are the dimensions of pith changed after it is once fully developed? With respect to the first question, observations made on the roots of young plants of *Acer pseudoplatanus*, *Fagus sylvatica*, and *Corylus Avellana*, showed him that the principal root is also furnished with pith. The second question Mr. Keith answers by the examination of a three-year-old ash stem which was almost 9 feet high. The last sprout, or shoot, was $\frac{5}{8}$ths of an inch in diameter, and had a pith of $\frac{1}{4}$th of an inch in diameter in the thickest part; the middle shoot was $\frac{7}{12}$ths of an inch thick, and had a pith of $\frac{1}{6}$th of an inch in diameter; the oldest and lowest twig had $\frac{7}{8}$ths of an inch in diameter, and the pith was $\frac{1}{10}$th of an inch thick. In the same twig the pith was not found to be of uniform thickness, but became thinner from the upper towards the lower extremity.

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* On the Discoid Pith of Plants, Ann. of Nat. Hist., Oct. 1839, p. 73–88.

† Of the Pith of Plants, Ann. of Nat. Hist., Ap. 1839, p. 77.

Of the beautiful anatomico-botanical plates which have been published by M. Link*, we have now received a third number, in which a great many of the most various and well-chosen objects are represented. In this number we see the great advances which the artist, M. C. F. Schmidt, has made as to execution; some of the plates, particularly tab. viii., may be said to belong to the most successful of their kind. Most of the figures show the structure of the roots of plants, and exhibit the difference therein between root and stem. On tab. viii. is found the anatomy of prickles and thorns, of which we had as yet scarcely any delineations.

M. Korthals† has communicated some remarks on the glanduliferous hairs of *Drosera,* with which my own observations do not agree. These hairs are said to consist of fibres or extended cells, which are covered by a scarcely developed epidermis, and support on the end a small red globule, which in old age falls off, but is also covered by the epidermis. The fibres of the hair extend into the cavity of the apex, but before their entry are somewhat widened. In the interior of this cavity the fibres form a small, egg-shaped, projecting body, and round this columella are found a quantity of small, red, angular particles, &c.

As in my paper on the organs of secretion of vegetables I have given a description and figures of the glanduliferous hairs of *Drosera* which are totally different from the above, it is necessary to enter very fully into the subject; but before I attempt to interpret the statements of M. Korthals, I must state, that I do not know what he understands by "epidermis:" this is unfortunately the result of the change and supposed improvement of old, well-known names. In the above memoir I have shown that the hairs of *Drosera* have a very complicated structure; the hair itself exhibits in its interior a spiral tube which penetrates deep into the apex of the gland, but there is no trace of a cavity in this so-called gland-head. The hairs which form the stalk of the gland are not here, as in most cases, simple excrescences of the upper walls of the epidermal cells, but true excrescences of the substance of the leaf, and appear very early, and therefore one may correctly say, that the whole hair and the head is covered by the epidermis. In quite young organs of this kind it may be seen very distinctly that the gland-head is nothing more than the apex of the compound hair which at a later period thickens, and then stalk and head are still covered by a uniform epidermis. Afterwards the stalk (that is, the hair) extends to a great length, and thereby all the cells obtain a lengthened form, and the outer layer does not differ from those beneath it.

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* Ausgewählte anatomisch-botanische Abbildungen. Berlin, 1839.

† Remarques sur les poils du Drosera. Bull. des Sci. &c. en Neerlande, p. 49, Rotterdam, 1839.

But with the gland-head it is quite different; the epidermis still retains its small cells, is generally filled with red-coloured sap, and exhibits the red angular bodies which M. Korthals mentions. With good microscopes one may see directly under this small-celled epidermis ten or twelve large, elongated, columnar cells, which form the axis of the gland-head; in their completely developed state they often exhibit in their interior very plain spiral fibres, and let the spiral tubes of the stalk run between them. Even in transverse sections there is nothing to be seen of a cavity in the gland-head, and that none such is present may be better seen in those glands which are found on the edges of the leaves of *Drosera rotundifolia*. These gland-hairs are (I do not know whether they are similarly formed in other species of *Drosera*) much larger than the others; the stalk is widened at the extremity like a spoon, and on the side of this spoon sits the glandular organ which effects the secretion.

It is peculiar to the glanduliferous hairs of *Drosera* (and herein they agree with the similar organs in *Nepenthes*), that here and there on the stalks are found small simple glands which consist of two adjoining vesicular cells; they are filled with green-coloured sap-globules, while the other cells of the stalk generally contain a red sap. It is as if these little glands took the place of the two semilunar cells of the cuticular glands; sometimes one sees real single cuticular glands with stomata; in *Nepenthes*, it is true, the structure of these accessory organs is different.

I* had the opportunity of procuring a couple of stems of *Musa paradisiaca*, the flower-stalks of which are (as I have already noticed, when at the Sandwich Islands) so very rich in unrollable spiral fibres. The fibres were extracted from the flower-stalks of the above stems with all possible care; and this was best effected by breaking the stalk into short pieces, drawing the ends about an inch or an inch and a half asunder, and then taking away the extracted fibres with a pair of wooden pincers, and throwing them directly into water, in order to free them in the first place from the adhering mucus, and secondly, from the tannic acid, from the presence of which they acquire a brown tinge when exposed to the air. The wool obtained in the above manner is equal to the finest sheep's wool, and surpasses it in whiteness, as also in the finer and more regular curling of the single filaments. The quantity obtained from the two stems was so considerable, that an artisan wished to make a glove out of it; and therefore it could not be difficult to obtain such large quantities of this material in the tropics (where every year thousands of pisang stems are cut down in some localities) as to be able to prepare valuable stuffs; indeed, shawls made of the fibres of the pisang could not be so expensive as the Persian ones.

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* Verhandlungen des Vereins zur Beforderung des Gartenbaues in den Preuss. Staaten. xiv. 2tes Heft. Berlin, 1839, p. 187.

MM. P. Savi and G. B. Amici* have made some communications concerning the stomata of plants. The observations of M. de Cesati on the stomata of *Ambrosinia Bassii,* which have not been confirmed by MM. Savi and Amici, were the cause of the research. M. de Cesati thought that he had observed a very peculiar structure in the cuticular glands and stomata of *Ambrosinia Bassii*; he speaks of a glandulous matter of which the outer edge of the stoma consists, which thereby presses apart the sides of the four inclosing cells. The real cleft is destined for the evaporation alone, whilst one of the two glandulous pads or circles is destined for the separation of carbon, the other for that of oxygen, &c. M. Savi examined *Ambrosinia* as far as regards its stomata, and found them similar in structure to those of other plants, as is shown by the figures; the stomata are usually formed by two semilunar cells, but they are covered by a second *cuticula,* which also exhibits a longitudinal cleft; even in the figure of a transverse section through the middle of such a stoma, this cuticle is represented with its slit. M. Amici also, in his answer to M. Savi, has confirmed the above statement with respect to the structure of the stomata of *Ambrosinia.* Finally, M. Amici proves that the priority of the discovery of the stomata in the bottom of the deep pits on the lower surface of the leaves of *Nerium* belongs to him, inasmuch as he communicated this discovery in a letter to M. Mirbel in August 1830, and this letter has been used by M. Brongniart, although the observation is rejected. [The presence of stomata in the hairy pits of the *Nerium* leaves was first published by M. Krocker, jun. of Breslau, in his dissertation 'De Epidermide Plantarum,' 1833.—*Mey.*]

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* Osservazioni sulla struttura ed esistenza degli stomi in alcune piante, &c. Mem. della R. Acad. delle Sc. di Torino, Serie ii. tom. ii. p. 49.

M. Morren* has examined anatomically several species of *Hedychium*, and has recorded his observations and accompanied them with figures. We receive information concerning the cells and their contents both in young and old leaves, as also on the occurrence of crystals in these different ages of the species of *Hedychium*; also several forms of crystals are mentioned as having been observed in these plants.

On the walls of the air-cells M. Morren found peculiar cells which were provided with green-coloured sap-globules, were of various forms, but very often corniform and hamate, sometimes symmetrical, sometimes umsymmetrical; they are said to be similar to the stelliform hairs of the *Nymphæa*, in which however I cannot agree, for these cells are nothing else than more or less regularly formed stellar-shaped cells, as they generally occur in the *Scitamineæ*. M. Morren also thinks that he has found that evaporation does not assist the formation of crystals in plants, inasmuch as it is exactly in the dry and peripheric parts of plants that crystals are not found. The other communications only confirm that which had been heretofore observed in *Hedychium*, or in other similar plants.

From M. Morren† we have received a similar work on the genus *Musa*: in it the formation of the stellar-formed cellular tissue is fully described, and some remarks are made on the acicular crystals found in the *Musæ* and other plants. The observations on the formation of the above-mentioned tissue confirm my former statements, viz. that those cells are produced from ordinary parenchym-cells. M. Morren saw the molecular motion in several cells of *Musa*, and after he had observed single parts of the plant in different stages of development, he arrived at the conclusion, that substances in the interior of the stellar-shaped cells make their appearance in the following order:—first appear self-moving gum or fecula-globules, then motionless chlorophyll (*i. e.* globules coloured by chlorophyll, *Mey.*), and then free globules and crystals: all these matters are formed successively. When considering the crystals which are found so frequently in the parenchymatic cells of *Musa*, M. Morren observes, that the crystal-bearing cells, which M. Turpin has called Biforines, decidedly require a peculiar name, and that in the case of *Caladium rugosum*, where they exhibit only one opening, they must be called Uniforines; and that from the same reason it is necessary to call the other cells, without openings, which contain acicular crystals, by a determinate name, and he proposes for them Clestines (from *κλειος*).

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* Bull. de l'Acad. Royale de Bruxelles, t. vi. no. 2.

† Observations sur l'Anatomie de *Musa*.—Bullet. de l'Acad. Roy. de Bruxelles, t. vi. no. 3.

I have shown in the former reports that there is no sufficient existing reason for giving these cells a distinct name as M. Turpin had done; but I can still less approve of these new appellations Uniforine and Clestine, because, if one examines the *Caladia* in regard to these cells, it is soon evident, that in different parts one and the same kind of cells is found in one place as Clestines, in another as Uniforines, and in others as Biforines, and the latter appear always as simple cells when in a young state: the different names would only lead us to suppose that there was here some actual difference. The opening of the so-called Biforines is evidently a purely physical phænomenon, as was proved in the former Report (p. 110). M. Morren remarks, that in the Clestines of *Musa* he had observed a gummous mass, an appearance which I myself have observed in other plants. The treatise is accompanied by good figures.

M. S. F. Hoffmann* has continued his observations on the hairs in the air-passages; he found them in all the species of *Limnanthemum* he examined, but without dots, and he convinced himself that they do not exist in *Villarsia*. Among the *Nymphææ*, the genus *Euryale* (*ferox*) exhibited such dotted hairs as are found in the air-cavities of the different organs of the genera *Nymphæa* and *Nuphar*.

M. Hoffmann treats of the same subject in the last part of the Tijdschrift of v. d. Hoeven and de Vriese for 1839, p. 269–271. In the same volume, p. 257–269, M. Hoffmann gives the results of his new researches as to *Lemna arrhiza* being a distinct species, as also anatomico-physiological observations on the formation of buds in the different species of *Lemna*: these communications are, however, only to be considered as the forerunners of a larger work which M. Hoffmann had sent to the press, and has just appeared in the first number for 1840 of Wiegmann's 'Archiv fur Naturgeschichte;' we shall therefore review it in our next Report.

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* Nachtrag zu des Beobachtung der Luftrohrenhaare bei *Limnanthemum*, Gmelin, and *Villarsia*, V.—Linnæa, xiii. pp. 294, 296.

M. Hoffmann* examined fresh peduncles of *Nelumbium luteum* and *speciosum,* the air-passages of which have diaphragms composed of a stellar-formed cellular tissue, but do not contain any such hairs as in the *Nymphææ.* M. Hoffmann found however that the sides of the air-cavities of these plants were covered with groups of crystals, which during their increase tear asunder the membranes of the inclosing cells, and in this manner project into the cavities, as in *Pontederia cordata* and *Myriophyllum,* &c.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

Naturalist's Library:—the Natural History of Dogs, vol. ii., *and the Natural History of Horses.*

These two volumes are from the pen of Lieut.-Col. Chas. Hamilton Smith, so well known for his valuable contributions to the volumes on Mammalia of Griffiths's edition of the 'Règne Animal.'

The author includes in the family *Canidæ,* or Dog tribe, the three genera *Canis, Hyæna,* and *Proteles.* The first of these genera he divides into numerous sections, the characters of which, in many instances, are far from being satisfactory.

In a former volume Col. Smith treats of the *Canidæ* which are *diurnal and have round pupils to the eyes,* constituting his subgenus *Chaon,* which includes the Wolves and Jackals; these the author subdivides into no less than ten sections.

The present volume contains an account of the Domestic Dogs, the Foxes, the Hyænas, and the curious genus *Proteles.*

The Domestic Dogs Col. Smith does not consider have descended solely from a species of Wolves or Jackals, "but from genuine Wild Dogs of more than one homogeneous species." The grounds upon which this opinion is founded are discussed in the first volume.

Although we suspect naturalists will not adopt Col. Smith's numerous new subdivisions of the *Canidæ,* still we feel sure his volumes on the Dogs, as well as the volume on Horses, will be regarded by them as most valuable contributions to their branch of science—the great research displayed by the author in the treatment of his subject has rendered them such.

Col. Smith combats the opinion expressed by some authors, that the aboriginal region where the Wild Horse was first subdued was Africa; and enters into a long argument to prove the original habitation of the Domestic Horse, considered as a single species, "should be sought in High Asia, about the fortieth degree of latitude, the table-land whence riding and charioteer nomads have incessantly issued, penetrating to the east, the south, and the west, from periods evidently anterior to historical record almost to our own times; that from Central Asia, northward and westward, and including, to the

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* Tijdschrift, &c., 1839, p. 271—274.